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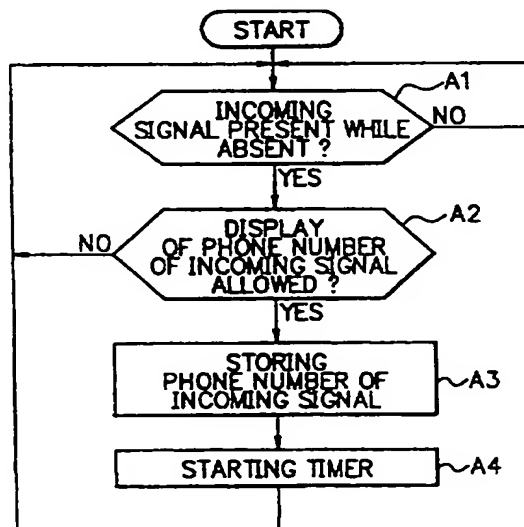
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(54) Abstract Title

Displaying telephone numbers and time elapsed since unanswered calls

(57) In a terminal incoming display device and method of a personal handy phone system, a controller detects A1 whether there was any incoming signal in the absence of the subscriber. When there was an incoming signal, the controller determines A2 whether a display of a telephone number of the incoming signal is possible. If display is possible, the telephone number of the incoming signal is stored A3 in a memory. Next the controller starts A4 a timer and the controller then continues to wait for further incoming signals. When required, the telephone number of the incoming signal may be read out from the memory and displayed on a display device together with the time currently counted by the timer. Thereby the user knows at what time or how much time earlier the incoming call was received.

FIG. 2



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FIG. 1

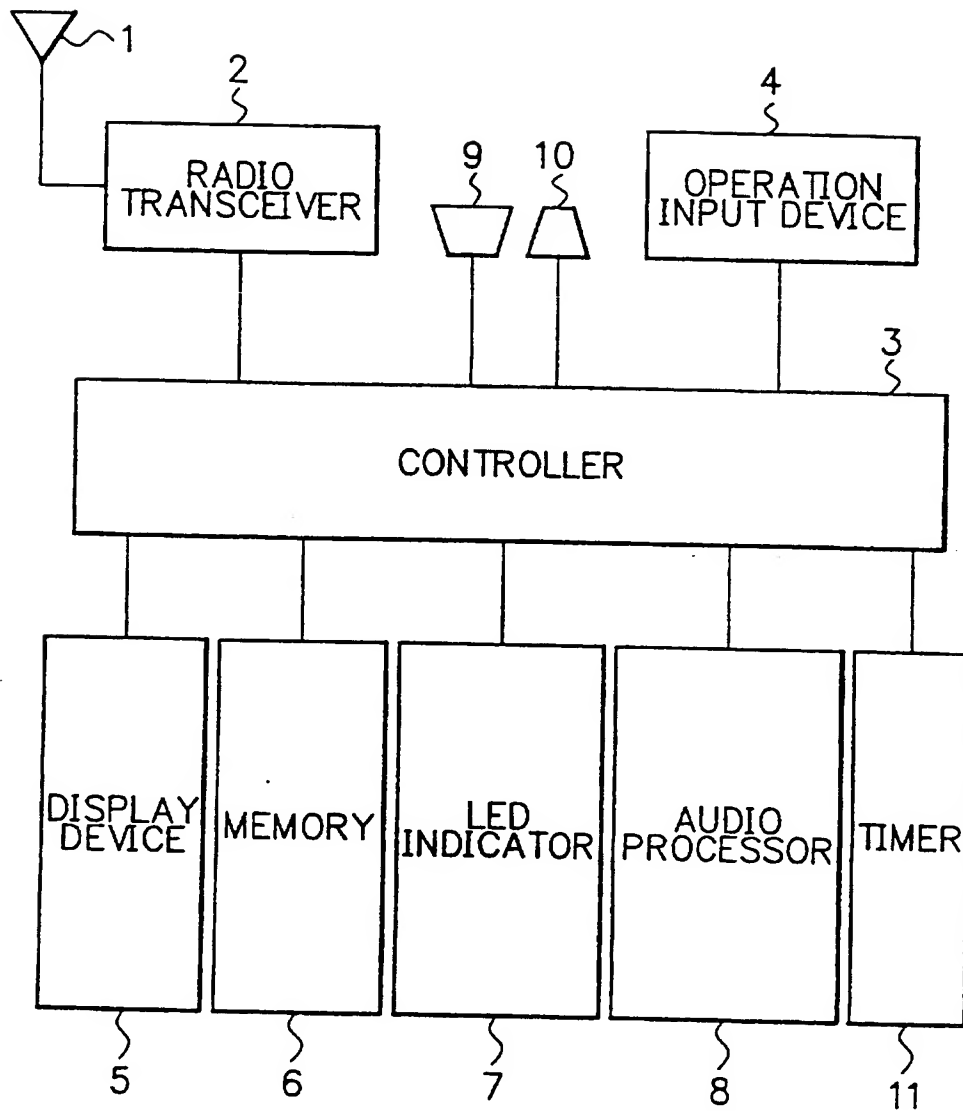


FIG. 2

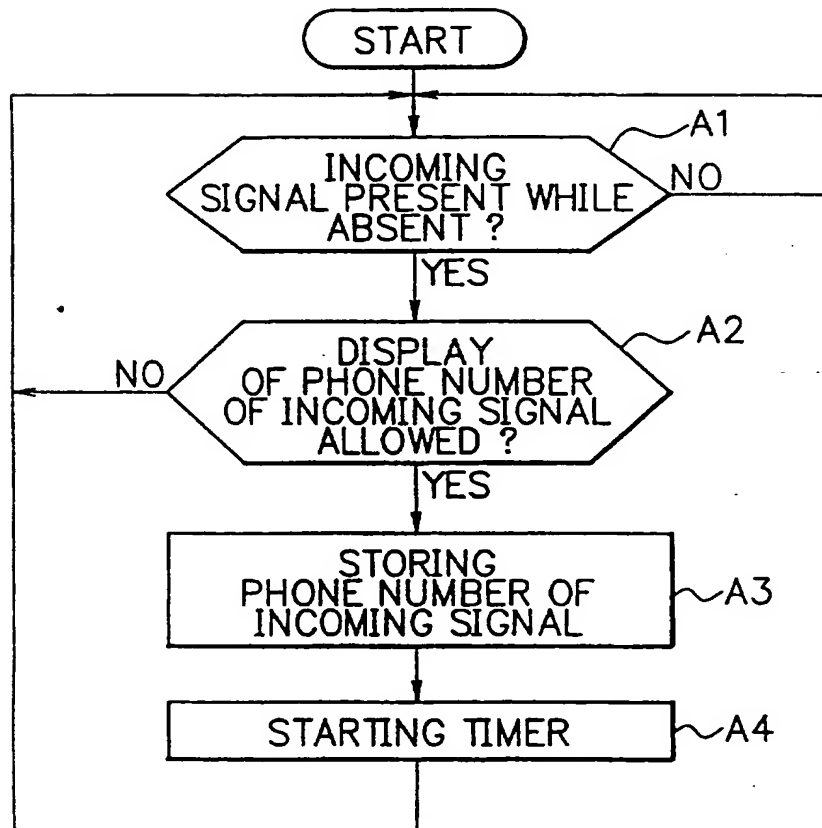


FIG. 3

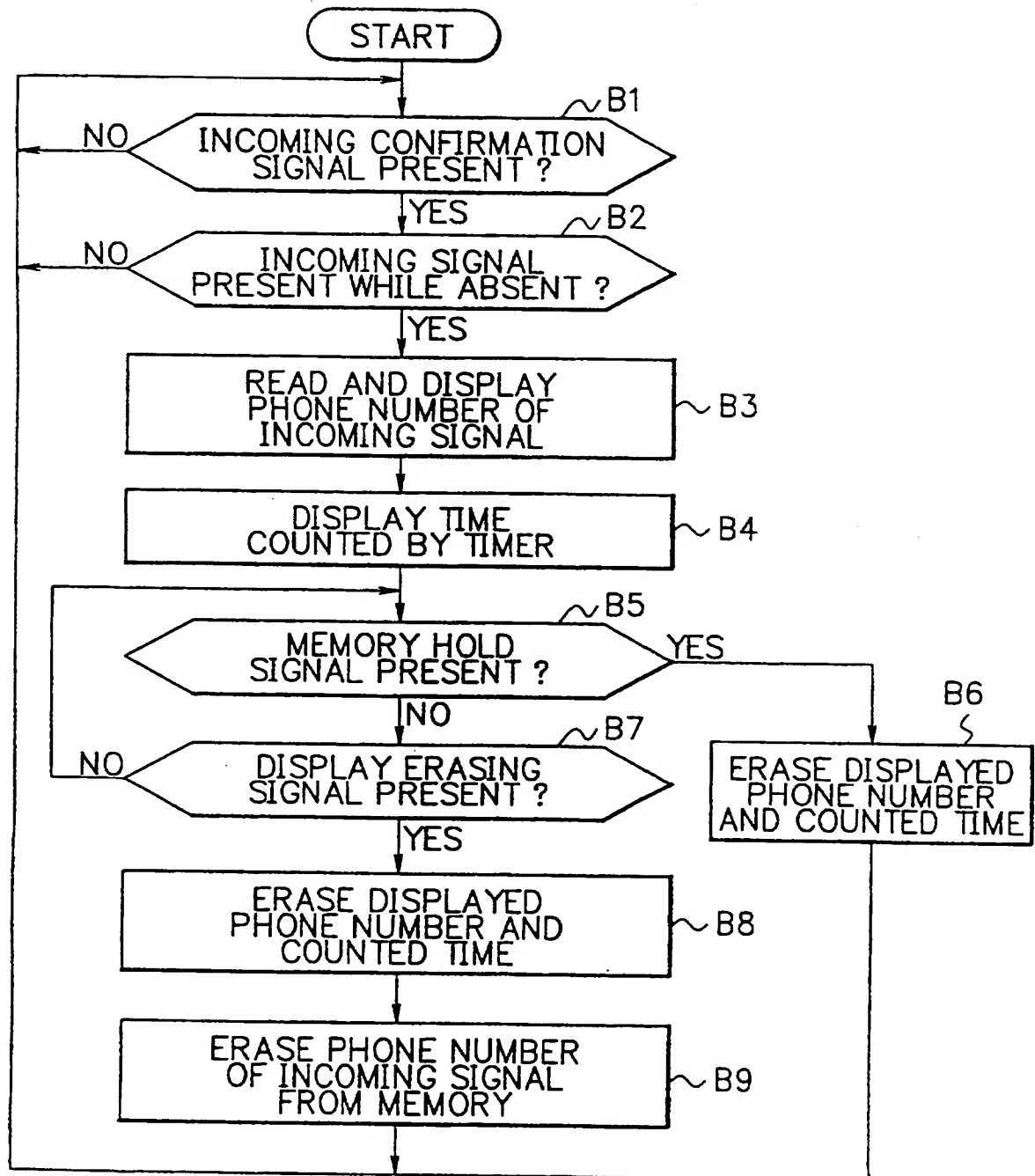
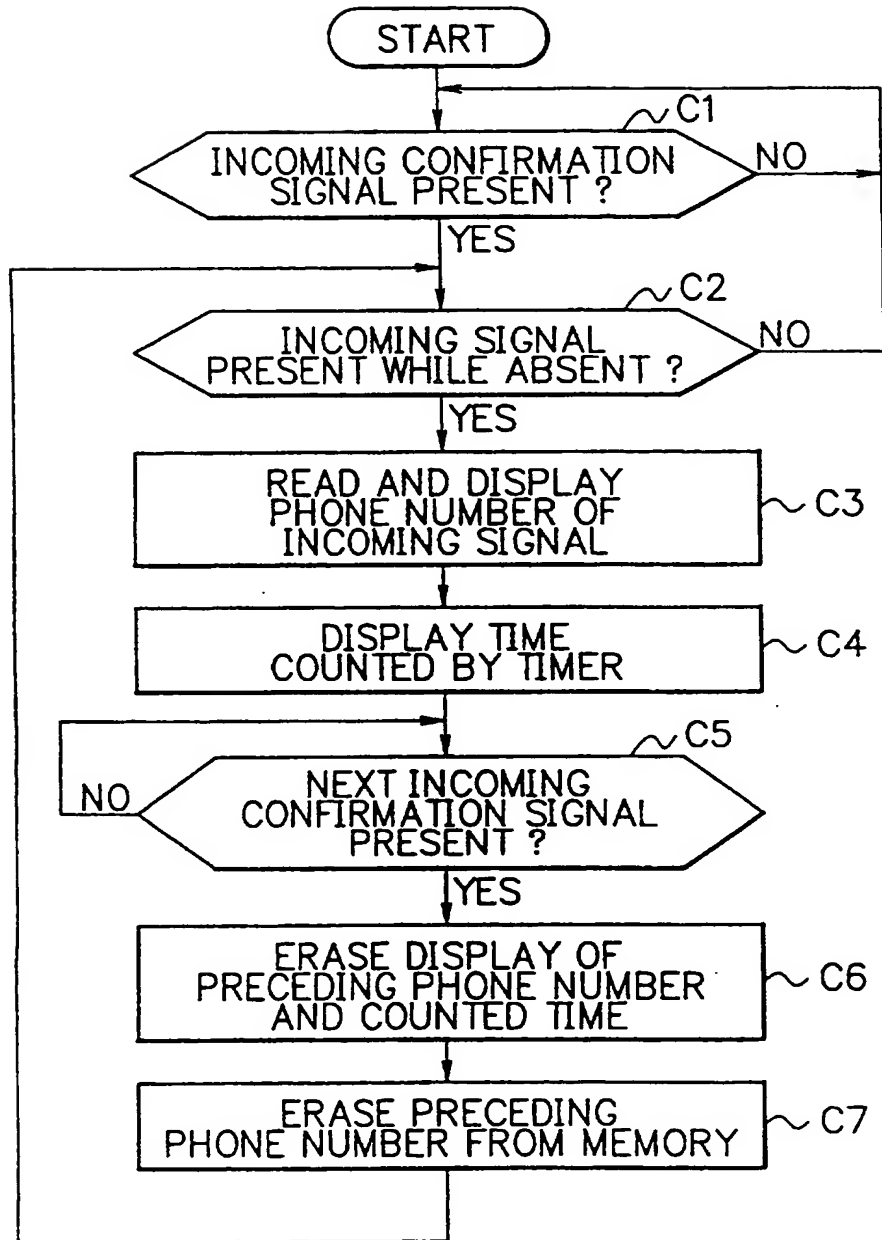


FIG. 4



TERMINAL INCOMING INDICATOR OF
PERSONAL HANDY PHONE SYSTEM AND
INDICATION METHOD THEREOF

BACKGROUND OF THE INVENTION

The present invention relates to a terminal incoming indicator of a personal handy phone system (PHS) and an indication method thereof, which indicate a telephone number of incoming signal in the absence of a telephone
5 subscriber.

Description of the Related Art

With respect to typical personal handy phone systems (PHS), there are mainly five types of them.

The first type would be a PHS which only notifies a presence of an
10 incoming call when there is one.

The second type would be a PHS which displays a telephone number of a caller, when the caller sends a telephone number display enabling signal.

According to the third type, a PHS stores incoming call information in a memory on receiving a call while the subscriber is absent, and displays a telephone
15 number of the caller when the subscriber operates to read out the stored information from the memory.

According to the fourth type, a PHS searches through a registered telephone directory inside the terminal when there is an incoming call received together with a telephone number display enabling signal. As the phone number of
20 the incoming call is found registered in the directory, the terminal displays the name as registered.

According to the fifth type, when there are several incoming calls from the same person (telephone number), the PHS bundles up the records of incoming calls to a single record.

25 However, with respect to those conventional types of PHSs, since they do not have a clock function, they are not capable of indicating when in the past or

how much time before they received an incoming call.

With respect to those conventional types of PHSs, when there are more than two incoming calls from the same caller (telephone number) while the subscriber is absent, it is impossible to know at what intervals the calls were received.

SUMMARY OF THE INVENTION

It is therefore a first object of the present invention to provide a terminal incoming indicator of a personal handy phone system (PHS) and an indication method thereof, capable of indicating when in the past or how much time before an incoming call was received.

A second object of the present invention is to provide a terminal incoming indicator of a personal handy phone system (PHS) and an indication method thereof, in which when there are more than two incoming calls from the same person (telephone number) while the subscriber is absent, it is possible to confirm at what intervals those calls were received.

According to a first aspect of the present invention, there is provided a terminal incoming indicator of a personal handy phone system comprising: an absence incoming signal determination means for determining a presence of any incoming signal in the absence of a subscriber; a display possibility determination means for determining whether a display of a telephone number of the incoming signal is possible, when the presence of the incoming signal is confirmed by the absence incoming signal determination means; a telephone number storing means for storing the telephone number of the incoming signal, when the display of the telephone number of the incoming signal is determined as possible by the display possibility determination means; a timer starter means for starting a timer, when the display of the telephone number of the incoming signal is determined as possible by the display possibility determination means; an incoming confirmation signal input means for inputting an incoming confirmation signal; and a telephone number/time display means for displaying the telephone number stored in the telephone number

storing means and time counted by the timer, on receiving the incoming confirmation signal from the incoming confirmation signal input means.

With respect to a second aspect of the present invention, there is provided a terminal incoming indicator of a personal handy phone system according to the first aspect, wherein the telephone number/time display means erases the already displayed phone number and the counted time, on receiving a succeeding incoming confirmation signal from the incoming confirmation signal input means, so as to display a telephone number corresponding to the succeeding incoming confirmation signal and counted time.

In accordance with a third aspect of the present invention, there is provided a terminal incoming indicator of a personal handy phone system according to the second aspect, further comprising a telephone number information erasing means for erasing the telephone number of the preceding incoming confirmation signal from the telephone number storing means, when the succeeding incoming confirmation signal is inputted by the incoming confirmation signal input means and the telephone number/time display means erases the already displayed telephone number and the counted time.

Regarding a fourth aspect of the present invention, there is provided a terminal incoming indicator of a personal handy phone system comprising: an absence incoming signal determination means for determining a presence of any incoming signal in the absence of a subscriber; a display possibility determination means for determining whether a display of a telephone number of the incoming signal is possible, when the presence of the incoming signal is confirmed by the absence incoming signal determination means; a telephone number storing means for storing the telephone number of the incoming signal, when the display of the telephone number of the incoming signal is determined as possible by the display possibility determination means; a timer starter means for starting a timer, when the display of the telephone number of the incoming signal is determined as possible by the display possibility determination means; an incoming confirmation signal input means for inputting an incoming confirmation signal; a telephone number/time

display means for displaying the telephone number stored in the telephone number storing means and time counted by the timer, on receiving the incoming confirmation signal from the incoming confirmation signal input means; a display erasing signal input means for inputting a display erasing signal which is applied in
5 erasing the display at the telephone number/time display means; a display erasing means for erasing the display at the telephone number/time display means, on receiving a display erasing signal from the display erasing signal input means; and a telephone number information erasing means for erasing the telephone number displayed by the telephone number/time display means from the telephone number
10 storing means, on receiving the display erasing signal from the display erasing signal input means.

According to a fifth aspect of the present invention, there is provided a terminal incoming indication method of a personal handy phone system comprising the steps of: an absence incoming signal determination step for determining a
15 presence of any incoming signal in the absence of a subscriber; a display possibility determination step for determining whether a display of a telephone number of the incoming signal is possible, when the presence of the incoming signal is confirmed at the absence incoming signal determination step; a telephone number storing step for storing the telephone number of the incoming signal in a telephone number
20 storage device, when the display of the telephone number of the incoming signal is determined as possible at the display possibility determination step; a timer starting step for starting a timer, when the display of the telephone number of the incoming signal is determined as possible at the display possibility determination step; an incoming confirmation signal input step for inputting an incoming confirmation
25 signal; and a telephone number/time display step for displaying the telephone number stored in the telephone number storage device and time counted by the timer on a display device, on receiving the incoming confirmation signal from the incoming confirmation signal input step.

In accordance with a sixth aspect of the present invention, there is
30 provided a terminal incoming indication method of a personal handy phone system

comprising the steps of: an absence incoming signal determination step for determining a presence of any incoming signal in the absence of a subscriber; a display possibility determination step for determining whether a display of a telephone number of the incoming signal is possible, when the presence of the incoming signal is confirmed at the absence incoming signal determination step; a telephone number storing step for storing the telephone number of the incoming signal in a telephone number storage device, when the display of the telephone number of the incoming signal is determined as possible at the display possibility determination step; a timer starting step for starting a timer, when the display of the telephone number of the incoming signal is determined as possible at the display possibility determination step; an incoming confirmation signal input step for inputting an incoming confirmation signal; a telephone number/time display step for displaying the telephone number stored in the telephone number storage device and time counted by the timer on a display device, on receiving the incoming confirmation signal from the incoming confirmation signal input step; a display erasing signal input step for inputting a display erasing signal which is applied in erasing the display on the display device; a display erasing step for erasing the display on the display device, on receiving a display erasing signal from the display erasing signal input step; and a telephone number information erasing step for erasing the telephone number displayed on the display device from the telephone number storage device, on receiving the display erasing signal from the display erasing signal input step.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and further objects and the novel feature of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings, in which:

Fig. 1 is a block diagram showing a PHS terminal incoming indicator as one embodiment of the present invention;

Fig. 2 is a flow chart explaining an operation of the PHS terminal

incoming indicator shown in Fig. 1 when there is an incoming call;

Fig. 3 is a flow chart explaining a first incoming confirmation operation of the PHS terminal incoming indicator shown in Fig. 1; and

Fig. 4 is a flow chart explaining a second incoming confirmation operation of the PHS terminal incoming indicator shown in Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, a description of a preferred embodiment of a terminal incoming indicator of a PHS and an indication method thereof will be given in detail.

Fig. 1 is a block diagram showing one embodiment of a PHS according to the present invention. The PHS comprises; an antenna 1, a radio transceiver 2, a controller 3, an operation input device 4, a display device 5, a memory 6, an LED (light-emitting diode) indicator 7, an audio processor 8, a speaker 9, a microphone 10, and a timer 11. The radio transceiver 2 is connected to both the antenna 1 and the controller 3. The controller 3 is connected to the radio transceiver 2, the operation input device 4, the display device 5, the memory 6, the LED indicator 7, the audio processor 8, the speaker 9, the microphone 10, and the timer 11.

The radio transceiver 2 serves to transmit/receive signal data to/from a base station and a control channel or a communication channel through the antenna 1. The operation input device 4 is where certain signals which are necessary for certain operations are inputted. The signals includes a telephone number, an incoming confirmation signal, a memory hold signal, a display erasing signal etc. The display device 5 is provided for displaying a phone number and time counted by the timer 11. The memory 6 is arranged for storing an incoming signal in the absence of the subscriber and storing a telephone number of the incoming signal at the same time. The LED indicator 7 turns lights on and off to inform that there is an incoming call or when the terminal enters the service area. The audio processor 8 conducts coding and combining processes on an audio signal. The speaker 9 generates a calling tone and an alarm sound suggesting that the terminal is outside

the service area. The microphone 10 collects sounds at a time of communication. The controller 3 is in charge of controlling the whole PHS.

Next, an operation of the PHS terminal incoming indicator of the present invention on receiving an incoming call will be described with reference to Fig. 2.

5 First, the controller 3 determines whether there was any incoming signal in the absence of the subscriber (step A1). When it is determined that there was an incoming signal in the absence of the subscriber, the controller 3 determines whether a display of a telephone number of the incoming signal is allowed or not (step A2). When it is determined that the display of the telephone number of the incoming
10 signal is not allowed, then the operation goes back to step A1. On the other hand, when it is determined that the display of the telephone number of the incoming signal is allowed, the controller 3 stores the telephone number in the memory 6 (step A3). Then the controller 3 starts the timer 11 (step A4), before returning to step A1.

15 Fig. 3 is a flow chart showing a first incoming confirmation operation of the PHS terminal incoming indicator of the present invention.

First, the controller 3 determines whether there is an incoming confirmation signal which is given in order to confirm whether there was any incoming signal in the absence of the subscriber (step B1). When the presence of
20 an incoming confirmation signal is recognized, then the controller 3 determines whether there was any incoming signal in the absence of the subscriber (step B2). When it is determined that there was no incoming signal in the absence of the subscriber, the operation returns to step B1. On the other hand, when it is determined that there was an incoming signal in the absence of the subscriber, the
25 controller 3 is to read out the telephone number of the incoming signal from the memory 6 so as to have the information displayed on the display device 5 (step B3). Then the controller 3 directs the display device 5 to display the time counted by the timer 11 (step B4).

Next, the controller 3 determines whether there is a memory hold signal
30 or not (step B5). When it is determined that there is a memory hold signal, the

controller 3 directs the display device 5 to erase the displayed telephone number of the incoming signal and the counted time (step B6), before returning to step B1. On the other hand, when there is no memory hold signal, the controller 3 is to determine whether there is a display erasing signal or not (step B7). When there is no display erasing signal, the operation goes back to step B5. Meanwhile, when there is a display erasing signal, the controller 3 directs the display device 5 to erase the displayed telephone number and the counted time (step B8). Then the controller 3 directs the memory 6 to erase the telephone number of the incoming signal stored therein (step B9), before returning to step B1.

Fig. 4 is a flow chart showing a second incoming confirmation operation of the PHS terminal incoming indicator of the present invention.

The controller 3 determines whether there is an incoming confirmation signal which is given in order to confirm whether there was any incoming signal in the absence of the subscriber (step C1). When the presence of an incoming confirmation signal is recognized, then the controller 3 determines whether there was any incoming signal in the absence of the subscriber (step C2). When it is determined that there was no incoming signal in the absence of the subscriber, the operation returns to step C1. On the other hand, when it is determined that there was an incoming signal in the absence of the subscriber, the controller 3 is to read out the telephone number of the incoming signal from the memory 6 so as to have the information displayed on the display device 5 (step C3). Then the controller 3 directs the display device 5 to display the time counted by the timer 11 (step C4).

Next the controller 3 determines whether there is a next incoming confirmation signal (step C5). When it is determined that there is a next incoming confirmation signal, the controller 3 directs the display device 5 to erase the telephone number of the preceding incoming confirmation signal and the counted time (step C6). Then the controller 3 directs the memory 6 to erase the telephone number of the preceding incoming confirmation signal stored therein (step C7), before returning to step C2.

According to the present invention, when there was an incoming call in

the absence of the subscriber, it is possible to know when or how much time before the incoming call was being received.

Further, according to the present invention, when there were more than two incoming calls from the same person (telephone number) in the absence of the subscriber, it is possible to know at what intervals the incoming calls were received.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or the scope of the following claims.

CLAIMS

1. A terminal incoming indicator of a personal handy phone system comprising:

an absence incoming signal determination means for determining a presence of any incoming signal in the absence of a subscriber;

5 a display possibility determination means for determining whether a display of a telephone number of the incoming signal is possible, when the presence of the incoming signal is confirmed by the absence incoming signal determination means;

10 a telephone number storing means for storing the telephone number of the incoming signal, when the display of the telephone number of the incoming signal is determined as possible by the display possibility determination means;

a timer starter means for starting a timer, when the display of the telephone number of the incoming signal is determined as possible by the display possibility determination means;

15 an incoming confirmation signal input means for inputting an incoming confirmation signal; and

20 a telephone number/time display means for displaying the telephone number stored in the telephone number storing means and time counted by the timer, on receiving the incoming confirmation signal from the incoming confirmation signal input means.

2. A terminal incoming indicator of a personal handy phone system as claimed in claim 1, wherein the telephone number/time display means erases the already displayed phone number and the counted time, on receiving a succeeding incoming confirmation signal from the incoming confirmation signal input means, so
5 as to display a telephone number corresponding to the succeeding incoming confirmation signal and counted time.

3. A terminal incoming indicator of a personal handy phone system as

claimed in claim 2, further comprising a telephone number information erasing means for erasing the telephone number of the preceding incoming confirmation signal from the telephone number storing means, when the succeeding incoming confirmation signal is inputted by the incoming confirmation signal input means and the telephone number/time display means erases the already displayed telephone number and the counted time.

4. A terminal incoming indicator of a personal handy phone system comprising:

an absence incoming signal determination means for determining a presence of any incoming signal in the absence of a subscriber;

5 a display possibility determination means for determining whether a display of a telephone number of the incoming signal is possible, when the presence of the incoming signal is confirmed by the absence incoming signal determination means;

10 a telephone number storing means for storing the telephone number of the incoming signal, when the display of the telephone number of the incoming signal is determined as possible by the display possibility determination means;

a timer starter means for starting a timer, when the display of the telephone number of the incoming signal is determined as possible by the display possibility determination means;

15 an incoming confirmation signal input means for inputting an incoming confirmation signal;

a telephone number/time display means for displaying the telephone number stored in the telephone number storing means and time counted by the timer, on receiving the incoming confirmation signal from the incoming confirmation signal input means;

20 a display erasing signal input means for inputting a display erasing signal which is applied in erasing the display at the telephone number/time display means;

a display erasing means for erasing the display at the telephone
 25 number/time display means, on receiving a display erasing signal from the display
 erasing signal input means; and

a telephone number information erasing means for erasing the telephone
 number displayed by the telephone number/time display means from the telephone
 number storing means, on receiving the display erasing signal from the display
 30 erasing signal input means.

5. A terminal incoming indication method of a personal handy phone
 system comprising the steps of:

an absence incoming signal determination step for determining a
 presence of any incoming signal in the absence of a subscriber;

5 a display possibility determination step for determining whether a display
 of a telephone number of the incoming signal is possible, when the presence of the
 incoming signal is confirmed at the absence incoming signal determination step;

a telephone number storing step for storing the telephone number of the
 incoming signal in a telephone number storage device, when the display of the
 10 telephone number of the incoming signal is determined as possible at the display
 possibility determination step;

a timer starting step for starting a timer, when the display of the
 telephone number of the incoming signal is determined as possible at the display
 possibility determination step;

15 an incoming confirmation signal input step for inputting an incoming
 confirmation signal; and

a telephone number/time display step for displaying the telephone
 number stored in the telephone number storage device and time counted by the timer
 on a display device, on receiving the incoming confirmation signal from the
 20 incoming confirmation signal input step.

6. A terminal incoming indication method of a personal handy phone

system comprising the steps of:

an absence incoming signal determination step for determining a presence of any incoming signal in the absence of a subscriber;

5 a display possibility determination step for determining whether a display of a telephone number of the incoming signal is possible, when the presence of the incoming signal is confirmed at the absence incoming signal determination step;

a telephone number storing step for storing the telephone number of the incoming signal in a telephone number storage device, when the display of the
10 telephone number of the incoming signal is determined as possible at the display possibility determination step;

a timer starting step for starting a timer, when the display of the telephone number of the incoming signal is determined as possible at the display possibility determination step;

15 an incoming confirmation signal input step for inputting an incoming confirmation signal;

a telephone number/time display step for displaying the telephone number stored in the telephone number storage device and time counted by the timer on a display device, on receiving the incoming confirmation signal from the
20 incoming confirmation signal input step;

a display erasing signal input step for inputting a display erasing signal which is applied in erasing the display on the display device;

a display erasing step for erasing the display on the display device, on receiving a display erasing signal from the display erasing signal input step; and

25 a telephone number information erasing step for erasing the telephone number displayed on the display device from the telephone number storage device, on receiving the display erasing signal from the display erasing signal input step.

7. A mobile telephone handset comprising:

means for determining the presence of any incoming signal in the absence of a subscriber, and for determining whether display of a telephone number of the incoming signal is possible;

5 a telephone number storing means for storing the telephone number of the incoming signal, when the display of the telephone number of the incoming signal is determined as possible;

an incoming confirmation signal input means for inputting an incoming confirmation signal; and

10 a telephone number/time display means for displaying, on receiving the incoming confirmation signal from the incoming confirmation signal input means, the telephone number stored in the telephone number storing means and the time since the determination that display of the telephone number of the incoming
15 signal was possible.

8. A terminal incoming indicator substantially as herein described with reference to the drawings.

9. A terminal incoming indication method substantially as herein described with reference to the drawings.



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Claims searched: 1 to 9

Examiner: Jared Stokes
Date of search: 8 April 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4K (KBHE, KBNJ, KFH)
H4L (LECX)

Int Cl (Ed.6): H04M (1/57, 1/64, 1/274)

Other: On-Line - WPI, EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2 303 025 A (Samsung) See abstract, page 7-lines 6-19	-
A	WO 98/16049 A1 (Philips) See abstract	-
A	US 5 463 676 (Ohsawa) See abstract	-

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.